

Chapter 5 Practice Test

- We wish to draw a sample of size 5 without replacement from a population of 50 households. Suppose the households are numbered 01, 02, . . . , 50, and suppose that the relevant line of the random number table is 11362 35692 96237 90842 46843 62719 64049 17823.

Then the households selected are

 - households 11 13 36 62 73
 - households 11 36 23 08 42
 - households 11 36 23 23 08
 - households 11 36 23 56 92
 - households 11 35 96 90 46
- Which of the following statements is FALSE?

 - Nonresponse can cause bias in surveys because nonrespondents often tend to behave differently from people who respond.
 - Non-sampling errors are often bigger than the random sampling errors in surveys.
 - Slight changes in the wording of questions can make a measurable difference in survey results.
 - People will sometimes answer a question differently for different interviewers.
 - Sophisticated statistical methods can always correct the results if the population you are sampling from is different from the population of interest, for example, due to undercoverage.
- A properly conducted survey randomly selected 1000 Canadians (from a total population of about 30 million) and 1000 Americans (from a total population of about 300 million). Which of the following is FALSE?

 - Random selection ensures that both samples are representative of their respective populations.
 - If 2000 Canadians and 2000 Americans were selected for the study, we could be confident that the sample result would be more accurate.
 - A smaller proportion of the American population has been chosen. Therefore, a particular person has a smaller chance of being selected in America than in Canada.
 - A potential stratification variable for both countries could be location: eastern, middle, or western continental.
 - Random digit dialing to select people for the survey could induce biases in the results if the characteristic of interest for the survey is related to income.
- A recent survey by a large-circulation Canadian magazine on the contribution of universities to the economy was circulated to 394 people who the magazine decided “are the most likely to know how important universities are to the Canadian economy.” The main problem with using these results to draw conclusions about the general public’s perception is

 - selection bias.
 - insufficient attention to the placebo effect.
 - no control group.
 - nonresponse bias.
 - interviewer bias.
- To test the effects of a new fertilizer, 100 plots were divided in half. Fertilizer A is randomly applied to one half, and B to the other. This is

 - an observational study.
 - a matched pairs experiment.
 - a completely randomized experiment.
 - a block design.
 - none of the above.
- A class in marketing designs two videos advertising an expensive Mercedes sports car. They test the videos by asking fellow students to view both (in random order) and say which makes them more likely to buy the car. Mercedes should be reluctant to agree that the video favored in this study will sell more cars because

 - there is no control group.
 - there is no placebo.
 - the study used a matched pairs design instead of a completely randomized design.
 - this is an observational study, not an experiment.
 - results from students may not generalize to the older and richer customers who might buy a Mercedes.

7. Which of the following is CORRECT?
- (a) We do not need to randomize if our sample size is sufficiently large.
 - (b) A large sample size always ensures that our sample is representative of the population.
 - (c) If all other things are equal, we need a larger sample size for a larger population.
 - (d) In a properly chosen sample, an estimate will be less variable with a large sample size and hence more precise.
 - (e) In random samples, the randomization ensures that we get precise and accurate estimates.
8. A committee on community relations in a college town plans to survey local businesses about the importance of students as customers. From telephone book listings, the committee chooses 150 businesses at random. Of these, 73 return the questionnaire mailed by the committee. The population for this study is
- (a) all businesses in the college town.
 - (b) all businesses.
 - (c) the 150 businesses chosen.
 - (d) the 73 businesses that returned the questionnaire.
 - (e) the committee on community relations.
9. A nutritionist wants to study the effect of storage time (6, 12, and 18 months) on the amount of vitamin C present in freeze dried fruit when stored for these lengths of time. Vitamin C is measured in milligrams per 100 milligrams of fruit. Six fruit packs were randomly assigned to each of the three storage times. The treatment, experimental unit, and response are respectively:
- (a) A specific storage time, amount of vitamin C, a fruit pack
 - (b) A fruit pack, amount of vitamin C, a specific storage time
 - (c) Random assignment, a fruit pack, amount of vitamin C
 - (d) A specific storage time, a fruit pack, amount of vitamin C
 - (e) A specific storage time, the nutritionist, amount of vitamin C
10. An experiment to measure the effect of giving growth hormones to girls affected by Turner's Syndrome was carried out recently in Vancouver. All 34 girls in the study were given the growth hormone and their heights were measured at the time the hormone was given and again one year later. No measurements were made on their final adult heights. Which of the following is *not* a problem with this experiment:
- (a) There was no blinding.
 - (b) There was no control group.
 - (c) Nonresponse bias
 - (d) There was insufficient attention to the placebo effect.
 - (e) Because final heights were not measured, it is impossible to tell if the hormone affected final height or only accelerated growth and made no difference to final height.
11. A new headache remedy was given to a group of 25 subjects who had headaches. Four hours after taking the new remedy, 20 of the subjects reported that their headaches had disappeared. From this information you conclude
- (a) that the remedy is effective for the treatment of headaches.
 - (b) nothing, because the sample size is too small.
 - (c) nothing, because there is no control group for comparison.
 - (d) that the new treatment is better than aspirin.
 - (e) that the remedy is not effective for the treatment of headaches.
12. A study of cell phones and the risk of brain cancer looked at a group of 469 people who have brain cancer. The investigators matched each cancer patient with a person of the same sex, age, and race who did not have brain cancer, then asked about use of cell phones. This is
- (a) an observational study.
 - (b) an uncontrolled experiment.
 - (c) a randomized comparative experiment.
 - (d) a matched pairs experiment.
 - (e) a survey.

Part 2: Free Response

13. Read the following article about the connection between vitamin E and heart bypass surgery.

Vitamin E may have special health benefits

Large doses of vitamin E apparently can reduce harmful side effects of bypass surgery in heart patients. A study involving 28 bypass patients found that the 14 patients who took vitamin E for two weeks before their operations had significantly better heart function after the procedure than the 14 patients who took placebos.

The vitamins apparently prevent damage to the heart muscle by destroying the toxic chemicals, called free radicals, that form when blood is cut off during the surgery, said Dr. Terrance Yau of the University of Toronto.

- Describe the experimental units/subjects in the experiment. How many were there?
 - Identify the explanatory variable(s).
 - How many treatments were there? ____ List them.
 - How many subjects were in each treatment group?
 - What was the response variable?
14. Does ginkgo improve memory? The law allows marketers of herbs and other natural substances to make health claims that are not supported by evidence. Brands of ginkgo extract claim to “improve memory and concentration.” A randomized comparative experiment found no evidence for such effects. The subjects were 230 healthy people over 60 years old. They were randomly assigned to ginkgo or a placebo pill (a dummy pill that looks and tastes the same). All the subjects took a battery of tests for learning and memory before treatment started and again after six weeks.
- What are the explanatory and response variables in this experiment?
 - Outline the design of this experiment.
 - The study was double-blind. What does this mean?
 - Use Table B, starting at line **103** (below), and choose only the first 5 members of the ginkgo group.
- | | | | | | | | | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 103 | 45467 | 71709 | 77558 | 00095 | 32863 | 29485 | 82226 | 90056 |
| 104 | 52711 | 38889 | 93074 | 60227 | 40011 | 85848 | 48767 | 52573 |
| 105 | 95592 | 94007 | 69971 | 91481 | 60779 | 53791 | 17297 | 59335 |
| 106 | 68417 | 35013 | 15529 | 72765 | 85089 | 57067 | 50211 | 47487 |
- It is discovered that men and women react differently the ginkgo. Outline the design of an experiment blocking for gender. (There are 100 women and 130 men in the sample.)
15. In late 1995, a Gallup survey reported that Americans approved of sending troops to Bosnia by 40% to 46% approval rate. The poll did not mention that 20,000 U.S. troops were committed to go. A CBS News poll mentioned the 20,000 figure and got the opposite outcome—a 33% to 58% disapproval rate. Briefly explain why the mention of the number of troops would cause such a big difference in the poll results. Write the name for the kind of bias that is at work here.
16. A church group interested in promoting volunteerism in a community chooses an SRS of 200 community addresses and sends members to visit these addresses during weekday working hours to inquire about the residents’ attitudes toward volunteer work. Sixty percent of all respondents say that they would be willing to donate at least an hour a week to some volunteer organization. Bias is present in this sample design. Identify the type of bias involved and state whether you think the sample percent obtained is higher or lower than the true population percent.
17. Give an example of undercoverage.
18. Here’s a quick and easy way to randomize. You have 100 subjects, 50 women and 50 men. Toss a coin. If it’s heads, assign the men to the treatment and the women to the control group. If the coin comes up tails, assign the women to treatment and the men to control. This gives every individual subject a 50-50 chance of being assigned to treatment or control. Why isn’t this a good way to randomly assign subjects to treatment groups?
19. Is the right hand generally stronger than the left in right-handed people? You can crudely measure hand strength by placing a bathroom scale on a shelf with the end protruding and then squeezing the scale between the thumb below and the four fingers above. The reading of the scale shows the force exerted. You have recruited 10 right-handed people to serve as subjects. Carefully describe the design of a matched pairs experiment to compare the strength of the right and left hands, using these subjects.